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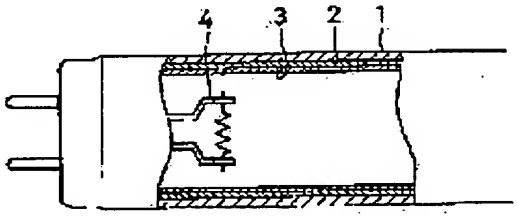
(54) FLUORESCENT LAMP

(57)Abstract:
PROBLEM TO BE SOLVED: To improve an appearance characteristic and the afterglow characteristic while preventing fall of a film of a luminescent layer by forming a first luminescent layer at a glass bulb side out of a phosphor containing boron and having the long afterglow characteristic, and forming a second luminescent layer on the discharge side out of a general lighting phosphor, and specifying the range of the quantity of adhesion of the first luminescent layer.
SOLUTION: A fluorescent layer 2 of a phosphor having a long afterglow characteristic expressed with a following chemical composition formula is formed in the inner surface of a glass bulb 1 in a range of quantity of adhesion at 0.2-8.0 mg/cm2. (M1-p-qEupQq)O.n(Al1-mBm)2O3 Hhere, 0.0001≤p≤0.5, 0.0001≤q≤0.5, 0.5≤n≤3.0, 0.0001≤m≤0.5, 0.0001≤p+q≤0.75. In the formula, M is at least one kind to selected from a group of bivalent metals Mg, Ca, Sr, Ba and Zn, and Q is an additional active agent to be selected from a group Mn, Zr, Nb, Pr, Nd, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu. High adhering strength of the phosphor to the glass bulb 1 is thereby obtained.



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CLAIMS

[Claim(s)]
[Claim 1] In the fluorescent lamp which has the 1st and 2nd luminous layer which becomes the inside of a glass bulb from one sort or two sorts or more of fluorescent substances With the fluorescent substance which has the high-persistence which shows the 1st luminous layer by the side of said glass bulb by the following chemical composition formula, the 2nd luminous layer by the side of discharge is formed with the fluorescent substance for general lighting, and it is the coating weight of the 1st luminous layer 1cm 2 Fluorescent lamp characterized by setting it as the range of 0.2-8.0mg of hits.
(M1-P-q EuP Qq) O-n (aluminum1-m Bm) 2O3 — here, 0.0001 <=p<=0.50.0001 <=q<=0.50.5 <=n<=3.00.0001 <=m<=0.50.0001 <=p+q<=0.75 — however It is at least one sort chosen from the group which M in an empirical formula is at least one sort chosen from the group of the divalent metal which consists of Mg, calcium, Sr, Ba, and Zn, and Q becomes from Mn, Zr, Nb, Pr, Nd, Gd, Tb, Dy, Ho, Er, Tm, Yb, and Lu by co-activating agent.
[Claim 2] In the fluorescent lamp which has the 1st and 2nd luminous layer which becomes the inside of a glass bulb from one sort or two sorts or more of fluorescent substances With the fluorescent substance which has the high-persistence which shows the 1st luminous layer by the side of said glass bulb by the following chemical composition formula, the 2nd luminous layer by the side of discharge is formed with the fluorescent substance for general lighting, and it is the coating weight of the 1st luminous layer 1cm 2 Fluorescent lamp characterized by setting it as the range of 0.2-8.0mg of hits.
(calcium1-P-q-r EuP Ndq Mnr) O-n (aluminum1-m Bm) 2O3 and kP 2O6 — here — 0.0001 <= - - p<=0.50.00005<=q<=0.50.00005<=r<=0.70.0001 <=p+q+r<=0.750.5 <=n<=3.00.0001 <=m<=0.50 <=k<=0.21 <=r/p<=20 — [Claim 3] The fluorescent lamp according to claim 1 or 2 characterized by having set the mean particle diameter of the fluorescent substance which has said high-persistence as the range of 5-15 micrometers, and setting particle size distribution as the range of 3-50 micrometers, respectively.
[Claim 4] The fluorescent lamp according to claim 1 or 2 characterized by forming said 2nd luminous layer in one sort or two sorts or more of phosphors using rare earth elements.
[Claim 5] The fluorescent lamp according to claim 1 or 2 characterized by forming the ultraviolet-rays reflecting layer which consists of an alumina or a magnesia between said glass bulb and 1st luminous layer.
[Claim 6] The fluorescent lamp according to claim 1 or 2 characterized by forming the conductive film of translucency between said glass bulb and 1st luminous layer.
[Claim 7] The fluorescent lamp according to claim 1 or 2 characterized by covering the peripheral face of said glass bulb in the protective layer of translucency.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not raflact tha original pracisaly.
2.**** shows the word which can not ba translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailad Description of tha Invention]
[0001]
[Field of the Invantion] About a fluorescent lamp, even if it passes 10 minutas or mora after [of aspecially this invention] lamp putting out lights, it relatas to amalioration of tha fluorascent lamp which presents tha afterglow which can identify an objact.
[0002]
[Dascription of the Prior Art] Generally, the fluorescent lamp for lighting forms the luminous layer which bacomas tha insida of for axampla, a glass bulb from a halo phosphata fluorascant substanca, a phosphor using rare earth elements, atc., and is constitutad.
[0003] For axampla, in the fluorescent lamp of the 40W type of straight pipas which usad the halo phosphate fluorescant substanca, the brightness of 2700-3100 (lm) is obtainad and offica is usad in tha larga fiald like the large-sized stora, the theater, the bathroom, and the underground center from tha first.
[0004] Evan when the electric currant is cut off according to disaster, such as a fira and an aarthquaka, in tha larga-sizad stora in which many man gathar aspecially, a theater, an underground center, etc., it is necassary to consider a human lifa to tha first maaning and to evacuata it safely and quickly.
[0005] Therefore, it is obligad to install a guida light, an emergency light, atc. in the large-sized store which fills conditions, lika have a tooth spaca more than fixad, and many man gather with Fira Service Law and tha Building Standard Law, a theater, and an undarground center other than a general lighting instrument.
[0006] These guida lights and an emergency light maka a fluorescant lamp for example, always [forward] turn on by the sourca power supply, and by using a built-in dc-battary as a power source, they ara constitutad in an emergency (at the time of interruption of servica) so that an illuminanca may be mora than 1 (Lx) and a fluorascant lamp thru/or an alectric bulb, etc. may be turned on 20 to 30 minutes or mora.
[0007] For this reason, aven if a source power supply should fail for power and a ganaral lighting instrumant atc. should put out the light in an amergency, since mora than 1 (Lx) is sacured also at tha lowast, insuranca and quick refuga of the illuminanca of a floor lina are attained.
[0008] However, sinca thesa guide lights and an emergancy light ara expensiva, there is faw tha installation as comparad with a general lighting instrument. For axampla, if crowdad when arrangad under the wall surfaca like an illuminatad exit routa light, in a person far from tha man near a wall surface, a significant differenca will arisa in the visibility of an illuminatad axit routa light, and effect will appear also in the quick nature of rafuga.
[0009] At tha ordinary homes which, on the other hand, do not hava the installation duty of such a guida light and an emergency light, whan the alactric current is cut off according to disastar, it may ba [rather than it is aasy] in rafuge of a child and an old man to take refuge smoothly [in being pitch-black] and quickly.
[0010]
[Problem(s) to be Solvad by tha Invention] Therafore, these people set to tha fluorescent lamp which has praviously the 1st and 2nd luminous layer which becomes tha inside of a glass bulb

from one sort or two sorts or mora of fluorascent substances. About tha 1st luminous layer by the sida of said glass bulb, a general formula is MAl 2O4. With the compound expressed M makas a mother crystal tha compound which consists of ona or more matallic elements chosen from the group which consists of calcium (calcium), strontium (Sr), and barium (Ba). With the fluorescent substanca which has tha high-persistenca which used europium (Eu) as an activator Tha 2nd luminous layer by the side of discharga is formad with the fluorascant substance for general lighting, such as a phosphor using rare aarth elements and a halo phosphate fluorascent substanca, and it is tha coating weight of tha 1st luminous layer 1cm 2 Tha fluorescent lamp set as 0.2mg or mora of hits was proposed (refer to JP,9-55191,A).
[0011] According to this proposal, even if it goes through quite long tima amount after putting out lights of this fluorescant lamp by using this fluorascent lamp lika the common fluorascent lamp for lighting, the illuminanca which can identify an object is obtained and the guida light-function and the function lika a night-light at the time of interruption of sarvica ara dona so.
[0012] However, in that production process, **** occurs no lass than 7% in a luminous layer by a mechanical vibration given to a glass bulb, an impact, etc., the appearance property after compliation is not only spoilad remarkably, but tha rata of an excellent articla also falls and this fluorescent lamp has the problem that it is difficult to maintain the graca of a product highly.
[0013] Moraovar, tha fluorascant substanca which has the high-persistence which constitutas tha 1st above-mentioned luminous layer is in the inclination to be easy to deteriorate at tha baking process in the production process of a fluorescent lamp, and a fluorascent lamp with which a much more big afterglow illuminanca is obtained from the decay characteristic aftar product completion baing spoiled is dasired.
[0014] So, the purposa of this invention is to offer tha fluorascent lamp which can also improva an appearanca property and the decay charactaristic, when **** of a luminous layer can be prevented by constituting a luminous layer from a fluorescant substanca which has the high-persistenca which contains boron at least.
[0015]
[Maans for Solving tha Problam] Therafora, this invention is set to the fluorescant lamp which has the 1st and 2nd luminous layar which becomes the inside of a glass bulb from one sort or two sorts or mora of fluorescent substancas, in order to attain tha above-mentionad purpose. With tha fluorescent substance which has the high-persistenca which shows the 1st luminous layer by the side of said glass bulb by tha following chamical composition formula, tha 2nd luminous layer by the side of discharge is formad with tha fluorascant substance for general lighting, and it is tha coating waight of tha 1st luminous layer 1cm 2 It is characterized by setting it as the ranga of 0.2-8.0mg of hits.
(M1-P-q EuP Qq) O-n (aluminum1-m Bm) 2O3 -- here 0.0001 <=p<=0.50.0001 <=q<=0.50.5 <=n<=3.00.0001 <=m<=0.50.0001 <=p+q<=0.75 -- however It is at least one sort chosen from tha group which M in an empirical formula is at least ona sort chosen from tha group of the divalent metal which consists of Mg, calcium, Sr, Ba, and Zn, and Q becomas from Mn, Zr, Nb, Pr, Nd, Gd, Tb, Dy, Ho, Er, Tm, Yb, and Lu by co-activating agant.
[0016] Moreover, invantion of the 2nd of this invantion is set to tha fluorascant lamp which has tha 1st and 2nd luminous layar which becomas the inside of a glass bulb from one sort or two sorts or mora of fluorascent substances. With the fluorescant substanca which has tha high-persistenca which shows the 1st luminous layer by the side of said glass bulb by tha following chamical composition formula, the 2nd luminous layer by the side of discharge is formad with tha fluorescent substanca for general lighting, and it is tha coating waight of the 1st luminous layer 1cm 2 It is characterizad by satting it as the ranga of 0.2-8.0mg of hits.
(calcium1-P-q-r EuP Ndq Mnr) O-n (aluminum1-m Bm) 2O3 and kP 2O6 -- hera -- 0.0001 <= -- p<=0.50.00005<=q<=0.50.00005<=r<=0.70.0001 <=p+q+r<=0.750.5 <=n<=3.00.0001 <=m<=0.50 <=k<=0.21 <=r/p<=20 and invantion of tha 3rd of this invention tha mean particla diamatar of the fluorascent substance which has said high-persistanca in the ranga of 5-15 micrometers It is charactarizad by satting particle siza distribution as the ranga of 3-50 micrometars, raspectivaly, and 4th invention is characterizad by forming said 2nd luminous layer in one sort or two sorts or mora of phosphors using rara aarth elemants.

[0017] Invention of the 5th of this invantion is characterized by forming the ultraviolat-rays raflecting layer which consists of an alumina or a magnesia batwean said glass bulb and 1st luminous layer. Furthermore, the 6th invention It is characterized by forming the conductive film of translucency between said glass bulb and 1st luminous layer, and 7th invention is further characterized by covering the peripheral face of said glass bulb in the protectiva layer of translucancy.
[0018]
[Embodiment of the Invention] Next, the 1st example of this invention is explained with reference to drawing 1 . In this drawing, 1 is a glass bulb and the 1st luminous layer 2 is formed with the fluorescent substance (the 1st fluorascent substance is called hereafter) which presants tha high-persistence shown by the following chemical composition formula to tha inside.
O-n 2O30.0001<=p<=0.50.0001<=q<=0.50.5 (aluminum1-m Bm) (M1-P-q EuP Qq) <=n<=3.00.0001 <=m<=0.50.0001 <=p+q<=0.75 -- however It is at least one sort chosen from the group which M in an empirical formula is at least one sort chosen from the group of the divalent metal which consists of Mg, calcium, Sr, Ba, and Zn, and Q becomes from Mn, Zr, Nb, Pr, Nd, Gd, Tb, Dy, Ho, Er, Tm, Yb, and Lu by co-activating agent.
[0019] Moreover, this 1st luminous layer 2 can also consist of fluorescent substancas (the 2nd fluorescent substance is called hereaftar) which present the high-persistance shown by the following chemical composition formula.
(calcium1-P-q-r EuP Ndq Mnr) O-n (aluminum1-m Bm) 2O3 and kP 2O6 -- here -- 0.0001 <= -- p<=0.50.00005<=q<=0.50.00005<=r<=0.70.0001 <=p+q+r<=0.750.5 <=n<=3.00.0001 <=m<=0.50 <=k<=0.21 <=r/p<=20, aspecially the coating waight of the 1st or 2nd fluorascent substance ara 2 1cm. It is set as the ranga of 0.2-8.0mg of hits. The mean particle diamater by FSSS (Fischer subsieve sizer) of this fluorescent substanca is set as the range of 5-15 micrometers, and particla siza distribution are set as the range of 3-50 micrometers, raspectively.
[0020] The laminating of the 2nd luminous layer 3 which consists of one sort or two sorts or more of fluorescent substances is carried out to this 1st luminous layer 2. This 2nd luminous layer 3 mixas one sort, such as phosphors using rara earth alements (Y2O3:Eu, LaPO4:Ce/Tb, 5 (SrCaBaMg) 3 (PO4) Cl:Eu, etc.), the fluorascent substances, for axample, the halo phosphate fluorescent substances, for general lighting (calcium10(PO4) 6 FCl:Sb/Mn etc.), or two sorts or more, and is formad. In forming thesa luminous layers 2 and 3, the whole thickness can be aqualized in comparison by setting up tha spreading diraction of the fluorescent substance coating liquid at the time of forming the 2nd luminous layer 3 contrary to the spreading direction of the fluorascent substanca coating liquid at the time of forming the 1st luminous layer 2. In addition, 4 is an electrode arrangad to tha both ends of the glass bulb 1.
[0021] Since boron is contained in the 1st fluorescent substance which constitutes the 1st luminous layer 2 according to this example, evan if a mechanical impact etc. is given in a production process by the ability improving the covering reinforcement to the glass bulb 1 of a fluorescent substance, **** of the 1st luminous layer 2 can be controlled and an appearance property and the decay characteristic can ba improved not to mention improvement in the rate of an excellent article.
[0022] If the 1st luminous layer 2 is especially constitutad from the 2nd fluorescent substance, since boron and a phosphoric acid are contained in this fluorascent substance, it not only can prevent **** certainly, but affinity with the glass bulb 1 of the 2nd fluorescent substanca improves, and it can increase an afterglow illuminance sharply by improvement in heat rasistance.
[0023] And since particle siza distribution are sat as the range which is 3-50 micrometers, raspectively in the range tha mean particla diamater of whose is 5-15 micrometers, the 1st or 2nd fluorascent substanca can prevent **** of a luminous layer 2 effectively conjointly with usa of an above-mentioned fluorescent substance. However, if mean particla diameter is set to lass than 5 micrometers, an afterglow illuminance will become small, and if it exceeds 15 micrometers conversely, generating of **** will come to increase. Moreover, in particle siza distribution, if a lass than 3-micromater thing is contained for the minimum grain size, an afterglow illuminance will become small, and conversaly, if that to which the maximum grain size exceeds 50

micrometers is contained, generating of **** will come to increasa. Therefora, as for maan particle diamater and particle siza distribution, it is dasirabla to set it as above-mentioned within tha limits.
[0024] Moreovar, since it consists of fluorescent substancas which were formed in the inside of tha glass bulb 1 in tha state of the laminating and which ara usad for tha fluorescant lamp for common lighting lika a phosphor using rara earth alemants in the 2nd luminous layar 3 of tha discharge road side among the 1st and 2nd luminous layar 2 and 3 at least, it is afficiently excitad by ultraviolet rays, such as 253.7 etc.nm, at the time of lamp lighting, and brightness can be made to increase sharply.
[0025] For moreover and the 1st luminous layer 2, it is formed in the glass bulb side, and the coating weight of that is 2 1cm. Since it is set as the range which is 0.2-8.0mg of hits, the 1st or 2nd fluorescent substance will be efficiently excited by the ultraviolet rays which penetrata the 2nd luminous layer 3, and will emit light by them. On the other hand, the synchrotron orbital radiation of ****** is directly emitted outside from the glass bulb 1 at the time of putting out lights. Therefora, the synchrotron orbital radiation from tha 1st luminous layer 2 can be made to be able to emit outside, without carrying out ****** attenuation, can raise an afterglow illuminanca, and can use it effectivaly also as induction light, such as an emergency.
[0026] Drawing 2 shows the 2nd example of this invention, and the ultraviolet-rays reflecting layer 5 which has translucancy is formed between the glass bulb 1 and the 1st luminous layer 2. Maan particla diameter is desirable 0.1 micrometers or less, and this ultraviolet-rays reflecting layer 5 is formed with the alumina (aluminum 2O3) of 30-50mmum, the magnesia (MgO), atc. By the way, although tha 1st and 2nd luminous layer 2 and 3 is excited by ultraviolet rays producad by discharge between electrodas 4, such as 253.7 etc.nm, and the fluorescant substanca located in a discharge road side is excitad afficiently, tha excitation efficiency of the fluorescent substance located in the glass bulb side which keeps away from a discharge way tends to fall a little. However, since the ultraviolat rays which penatratad tha 1st and 2nd luminous layer 2 and 3 ara reflected by the ultraviolet-rays reflecting layer 5 according to this example, tha fluorescent substanca located in a glass bulb side will ba excited by the ultraviolet rays and the reflected ultraviolat rays at the time of transparency. Therefore, luminous afficiency can be raised.
[0027] Moreover, discoloration by sow RARIZE-SHON can be prevented thru/or reduced by the relation which can control tha contact to the glass bulb 1 of mercury by forming the ultraviolat-rays reflecting layer 5 by the alumina, for example.
[0028] Drawing 3 shows the 3rd example of this invantion, and the conductive film 6 which has translucancy is formad between the glass bulb 1 and tha 1st luminous layer 2. This conductiva film 6 is formed by spraying the solution which contains chlorination tin in the inside of the glass bulb of for example, a heating condition. This coat 6 has about [1-1000Kohm] resistance.
[0029] According to this example, it can apply to lighting fitting equipped with tha lighting circuit apparatus of a rapid start type, and carries out suitable to use in the place which wants to save the time and effort of maintenance like a large-sized store, a theater, and an underground canter.
[0030] If the ultraviolat-rays reflecting layer 5 shown in drawing 2 is espacially formed between the glass bulb 1 and a conductive film 6, the discoloration produced when mercury contacts the tin of a coat 6 etc. can be prevanted thru/or reduced not to mention an improvement of brightnass. Therefore, the appearance condition as a fluorascent lamp can be improved.
[0031] Drawing 4 shows the 4th exampla of this invantion, and the protective layar 7 is formed in tha peripheral faca of the glass bulb 1. This protective layer 7 consists of resin material, such as polyethylene terephthalata (PET), and thickness is set as 100-150 micrometers. It is made to haat and contract at 150-200 dagrees C, and this protective layer 7 is formed by making it stick to the peripheral faca of the glass bulb 1, aftar being beforehand constitutad in the shape of a tube and inserting tha glass bulb 1 in the interior of this. If ultraviolet absorption material, such as titanium oxide (TiO2), is mada to mix in a protective layer 7 espacially, the lightfastness of a protactive layer 7 is not only improvable, but it will act as an ultraviolet-rays pravention layer. In addition, this configuration is applicable also to the fluorescent lamp shown in drawing 2 or

drawing 3 .
[0032] According to this example, since the protective layers 7, such as a product made of resin, are formed in the peripheral face of the glass bulb 1, even if the glass bulb 1 should be damaged in an emergency, the illuminance of extent which it not only can prevent scattering, but can identify an object in the condition of having damaged is obtained. Therefore, smooth and quick refuge is attained.
[0033] If this fluorescent lamp is moreover removed from lighting fitting, since it can use as a substitute of a flashlight, what demonstrates not only refuge induction but the power which plans in respect of being various and is not found is conjectured.
[0034] In addition, a fluorescent lamp can apply straight pipe form fluorescent lamps other than a 40W type to a circular fluorescent lamp, a compact fluorescent lamp, a compact self-ballasted fluorescent lamp, etc. from the first, for example, without this invention being restrained by only the above-mentioned example in any way.
[0035]
[Example] Next, the 1st example of an experiment is explained. First, while forming the 1st luminous layer by slushing into the inside of the bulb for floor line40 the fluorescent substance coating liquid containing the 2nd fluorescent substance whose mean particle diameter is 10 micrometers and whose particle size distribution are 5-35 micrometers, the 2nd luminous layer is formed on the 1st luminous layer by slushing into the bulb for floor line40 the fluorescent substance coating liquid containing three kinds of phosphors using rare earth elements which present luminescence to a three-wave region. in addition, the coating weight of the 1st luminous layer — 5.0 mg/cm2 it was .
[0036] In the condition of having arranged the illuminometer at the point isolated 1m from the central part of this fluorescent lamp, continuation lighting of the fluorescent lamp was carried out for 15 minutes with rated voltage, and when transition of the afterglow illuminance when switching off a fluorescent lamp after that was measured, the result shown in drawing 5 was obtained.
[0037] The afterglow illuminance of the fluorescent lamp concerning this invention in 0.5 seconds improves after putting out lights sharply [the conventional fluorescent lamp which these people proposed previously] more than twice [about] so that more clearly than this drawing. Since the heat deterioration of the 2nd fluorescent substance in a baking process was eased, this is guessed.
[0038] Moreover, when it manufactured 100 starting-this invention and conventional example fluorescent lamps at a time, respectively and the incidence rate of **** was measured, in elegance, it was 7% conventionally to having been 0.001% in this invention article.
[0039] Next, the 2nd example of an experiment is explained. In the 1st example of an experiment, when floor line40 fluorescent lamp to which the mean particle diameter of the 2nd fluorescent substance was changed in 3-20 micrometers was manufactured and the propriety of a **** situation and an afterglow illuminance was measured thru/or observed, the result shown in drawing 6 was obtained. In addition, when carrying out natural fall of the 1g weight only once on a fluorescent lamp from height of 50cm, whether **** with a diameter of 1mm or more occurred performs measurement of **** to a luminous layer, and it is shown that x mark generated that **** with a diameter of 1mm or more did not generate O mark. Moreover, in the evaluation criteria of an afterglow illuminance, it is shown that, as for O mark, the improvement effect was accepted as compared with the conventional example and that, as for x mark, an improvement effect was not accepted.
[0040] In the range whose mean particle diameter is 3-15 micrometers, although generating of **** was not accepted, generating of **** with mean particle diameter remarkable in 20 micrometers is seen, and it is understood that the covering reinforcement to the glass bulb of a luminous layer is weak, so that more clearly than this drawing. On the other hand, although the improvement effect over the conventional example was accepted in the afterglow illuminance in the range whose mean particle diameter is 5-20 micrometers, mean particle diameter was not accepted by 3 micrometers. The mean particle diameter of the fluorescent substance which presents high-persistence from this result has the desirable range of 5-15 micrometers.

[0041]
[Effect of the Invention] As mentioned above, since the fluorescent substance which presents the high-persistence in which boron is contained at least to the 1st luminous layer by the side of a glass bulb is used according to this invention, even if it can improve the covering reinforcement to the glass bulb of this fluorescent substance and a mechanical impact etc. is given to a glass bulb at the time of a production process thru/or use, **** of the 1st luminous layer can be controlled and an appearance property and the decay characteristic can be improved not to mention improvement in the rate of an excellent article.
[0042] If the 1st luminous layer is especially constituted from the 2nd fluorescent substance, since boron and a phosphoric acid are contained in this fluorescent substance, it not only can prevent **** certainly, but affinity with the glass bulb 1 of the 2nd fluorescent substance improves, and it can increase an afterglow illuminance sharply by improvement in heat resistance.
[0043] And since particle size distribution are set as the range which is 3-50 micrometers, respectively in the range the mean particle diameter of whose is 5-15 micrometers, the fluorescent substance which presents high-persistence can prevent **** of a luminous layer effectively conjointly with use of an above-mentioned fluorescent substance.
[0044] Furthermore, for the 1st luminous layer, it is formed in the glass bulb side, and the costing weight of that is 2 1cm. Since it is set as the range which is 0.2-8.0mg of hits, the 1st luminous layer will be efficiently excited by the ultraviolet rays which penetrate the 2nd luminous layer, and will emit light by them. On the other hand, the synchrotron orbital radiation of ****** is directly emitted outside from a glass bulb at the time of putting out lights. Therefore, the synchrotron orbital radiation from the 1st luminous layer can be made to be able to emit outside, without carrying out ****** attenuation, can raise an afterglow illuminance, and can use it effectively also as induction light, such as an emergency.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The important section sectional view showing the 1st example of this invention.
[Drawing 2] The important section sectional view showing the 2nd example of this invention.
[Drawing 3] The important section sectional view showing the 3rd example of this invention.
[Drawing 4] The important section sectional view showing the 4th example of this invention.
[Drawing 5] Drawing showing the afterglow illuminance to the elapsed time after putting out lights.
[Drawing 6] Drawing showing the relation between **** to the mean particle diameter of the fluorescent substance which constitutes the 1st luminous layer, and an afterglow illuminance.
[Description of Notations]
1 Glass Bulb
2 1st Luminous Layer
3 2nd Luminous Layer
5 Ultraviolet-Rays Reflecting Layer
6 Conductive Film
7 Protective Layer

[Translation done.]